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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/781,336	02/17/2004	Kaushik Saha	2110-107-3	9427

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EXAMINER

DO, CHAT C

ART UNIT PAPER NUMBER

2193

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/28/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/781,336

Applicant(s)

SAHA ET AL.

Examiner

Chat C. Do

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02/17/04; 07/19/04.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 February 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 02/17/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated, further it is disclosed in the background of invention and as the basic structure of well known butterfly in FFT. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the limitations cited in claims 1-23 must be shown without introduce new subject matter or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must

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be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

3. The disclosure is objected to because of the following informalities:

The applicant is advised to have subject matters of the claims in the disclosure without introducing new subject matter.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 3-4, 7-8, 14-15, and 18-19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Re claim 3, the limitations cited in the claim are unclear, particularly inserting "0" in certain bit of the operand, because the claim does not clearly define the structure of

having the limitations with the rest of the claim. Further the specification does not clearly disclose why and how the inserting "0" is needed for distributing data among P processors. For examination purposes, the examiner disregards the limitations. Claims 7, 14, and 18 have the same rejection.

Re claim 4, the limitations cited in the claim are unclear, particularly appending a specified number of "0"s in for the twiddle factor, because the claim does not clearly define the structure of having the limitations with the rest of the claim. Further the specification does not clearly disclose why and how the appending a specified number of "0"s in for the twiddle factor is needed for distributing data among P processors. For examination purposes, the examiner disregards the limitations. Claims 8, 15, and 19 have the same rejection.

Claim Rejections - 35 USC § 101

6. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

7. Claims 1-23 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 1-23 cite a method and system for performing FFT/IFFT in accordance with a mathematical algorithm. In order for claims to be statutory, claims must either include a practical/physical application or a concrete, useful, and tangible result. However, claims 1-23 merely disclose steps/components for performing FFT/IFFT

without further disclosing a practical/physical application or a useful and tangible result.

Therefore, claims 1-23 are directed to non-statutory subject matter.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1-2, 5-6, 9-10, 16-17, and 20-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Laxmi et al. ("Performance Analysis of FFT Algorithms on Multiprocessor Systems").

Re claim 1, Laxmi et al. disclose in pages 512-521 a scalable method for implementing FFT/IFFT computations in multiprocessor architectures (e.g. abstract section in page 512) that provides improved throughput by eliminating the need for inter-processor communication after the computation of the first "log.sub.2P" stages (e.g. first two stage of Figure 2) for an implementation using "P" processing elements (e.g. four processing elements in Figure 2), comprising the steps of: computing each butterfly of the first "log.sub.2P" stages on either a single processor or each of the "P" processors simultaneously (e.g. Figure 2, wherein $P = N/P$ as seen in section II "Radix-2 FFT computation" in right column page 513, particularly step 1), distributing the computation of the butterflies in all the subsequent stages among the "P" processors such that each chain of cascaded butterflies consisting of those butterflies that have inputs and outputs

connected together, are processed by the same processor (e.g. Figure 2, section II "Radix-2 FFT computation" in right column page 513, particularly steps 2-3).

Re claim 2, Laxmi et al. further disclose in pages 512-521 the distributing of the computation of the butterflies subsequent to the first "log.sub.2P" butterflies is achieved by assigning operand addresses of each set of butterfly operands to each processor in such a manner that the butterfly is processed by the same processor that computed the connected butterfly of the previous stage in the same chain of butterflies (e.g. Figure 2, section II "Radix-2 FFT computation" in right column page 513, particularly steps 2-3 and first paragraph of right column in page 514).

Re claim 5, it is a system claim of claim 1. Thus, claim 5 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 6, it is a system claim of claim 2. Thus, claim 6 is also rejected under the same rationale as cited in the rejection of rejected claim 2.

Re claim 9, it has similar limitations cited in claim 1. Thus, claim 9 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 10, Laxmi et al. further disclose in pages 512-521 the first log.sub.2(P) stages of the transform are calculated on all of the processors operating in parallel (e.g. Figure 2 and first paragraph of right column in page 514).

Re claim 16, Laxmi et al. disclose in pages 512-521 a processor system, comprising: a plurality of processors operable to execute a fast Fourier transform or inverse fast Fourier transform algorithm on a plurality of inputs to generate a plurality of outputs (e.g. PE1-PE4 in Figure 2), each transform including a plurality of stages

containing at least one butterfly computational block (e.g. butterfly operation in PE), and the processors operable to the butterfly computational block for the first "log.sub.2P" stages of the transform on either a single one of the processors or on a plurality of the processors operating in parallel (e.g. Figure 2, wherein $P = N/P$ as seen in section II "Radix-2 FFT computation" in right column page 513, particularly step 1); and address circuitry operable to distribute the computation of the butterfly computational blocks in all stages subsequent to the first log.sub.2P states among the plurality of processors such that each chain of cascaded butterfly computational blocks in the transform are coupled in series and are computed by the same processor (e.g. Figure 2, section II "Radix-2 FFT computation" in right column page 513, particularly steps 2-3).

Re claim 17, it has similar limitations cited in claim 13. Thus, claim 17 is also rejected under the same rationale as cited in the rejection of rejected claim 13.

Re claim 20, Laxmi et al. further disclose in pages 512-521 each of the processors comprises a digital signal processor (e.g. introduction section in page 512).

Re claim 21, it has similar limitations cited in claim 16. Thus, claim 21 is also rejected under the same rationale as cited in the rejection of rejected claim 16.

Re claim 22, Laxmi et al. further disclose in pages 512-521 the electronic system comprises a communications system (e.g. abstract and introduction sections in page 512).

Re claim 23, it has similar limitations cited in claim 20. Thus, claim 23 is also rejected under the same rationale as cited in the rejection of rejected claim 20.

Claim Rejections - 35 USC § 103

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 11-13 are rejected under 35 U.S.C. 103(a) as being obvious over Laxmi et al. ("Performance Analysis of FFT Algorithms on Multiprocessor Systems").

Re claim 11, Laxmi et al. further disclose in pages 512-521 the method is performed on two processors (e.g. last paragraph left column and first paragraph right column in page 514 wherein $P = 2$), and wherein the first two stages of a radix-2 fast Fourier transform or inverse fast Fourier transform are calculated, and wherein the subsequent stages of the transform are computed as radix-2 stages (e.g. Figure 2 as radix-2). Laxmi et al. fail to disclose in pages 512-521 the first two radix-2 can be performed as radix-4. However, the implementation logically and mathematically of radix-4 as two radix-2 or vice versa is well known in the art of technology and widely used. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to replace the two radix-2 as one radix-4 into Laxmi et al.'s invention because it would enable to increase the system performance by operating the radix-4 in single unit.

Re claim 12, Laxmi et al. further disclose in pages 512-521 chains comprises a single loop that iterates $N/2 * (\log_2(N/2)) / (\text{number of processors})$ times (e.g. Figure 2 and step 3 in the last paragraph right column in page 513).

Re claim 13, Laxmi et al. further disclose in pages 512-521 each butterfly computational block includes a plurality of operands each having an associated address (e.g. fetching data from storage), and wherein calculating chains of butterfly computational blocks corresponding to the subsequent stages comprises assigning addresses to each of the operands so that each butterfly block in a chain is calculated in the same processor (e.g. Figure 2).

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- a. U.S. Patent Publication No. 2002/0184279 to Kechriotis discloses a system and method for computing a discrete transform.
- b. U.S. Patent No. 6,792,441 to Jaber discloses a parallel multiprocessing for the Fast Fourier transform with pipeline architecture.
- c. U.S. Patent No. 6,751,643 to Jaber discloses a butterfly-processing element for efficient Fast Fourier Transform method and apparatus.
- d. U.S. Patent No. 6,618,800 to Weiss et al. disclose a procedure and processor arrangement for parallel data processing.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chat C. Do whose telephone number is (571) 272-3721. The examiner can normally be reached on M => F from 7:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai An can be reached on (571) 272-3756. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chat C. Do
Examiner
Art Unit 2193

March 23, 2007

A handwritten signature in black ink, appearing to be 'Chat C. Do', written in a cursive style.